

WHAT IS CLAIMED IS:

1 1. A method of recovering from malfunctions in a first
2 agent module that is installed in a modular network
3 device having a plurality of network interface modules
4 housed in a chassis where the first agent module performs
5 management and system controller functions, the method
6 comprising the steps of:

7 installing a second agent module in the chassis and
8 asserting a present signal of the second agent to notify
9 the first agent module that the second agent module is
10 present;

11 determining, at the second agent module, if the first
12 agent module is installed when a present signal, a ready
13 signal and a privilege signal of the first agent module
14 are asserted;

15 synchronizing configuration information of the network
16 interface modules from the first agent module to the
17 second agent module after a ready signal of the second
18 agent module is asserted;

19 periodically sending a message, from the first agent
20 module to the second agent module, indicating that the
21 first agent module has not failed;

22 detecting, at the second agent module, that the
23 malfunctions in the first agent module occur if the
24 second agent module cannot receive the message within a
25 predetermined time interval;

26 rebooting the modular network device including the
27 first agent module and the second agent module; and

28 . performing the management and system controller
29 functions by the second agent module using the
30 synchronized configuration information.

1 2. The method as recited in claim 1 further comprising
2 the step of:

3 re-synchronizing the second agent module to the first
4 agent module when any configuration information is
5 modified on the first agent module.

1 3. The method as recited in claim 2 further comprising
2 the steps of:

3 asserting the ready signal of the second agent module
4 after the rebooting step to indicate that the second
5 agent module has completed an initialization process; and
6 asserting a privilege signal of the second agent module
7 to indicate that the second agent module has taken over
8 the management and system controller functions previously
9 performed by the first agent module.

1 4. The method as recited in claim 3 further comprising
2 the steps of:

3 if the first agent module recovers to a normal
4 operating condition after the rebooting step, performing
5 the steps of:

6 de-asserting the privilege signal of the first agent
7 module; and

8 determining, at the first agent module, if the second
9 agent module has taken over the management and system
10 controller functions when the present, ready and

11. privilege signals of the second agent module are
12 asserted.

1 5. The method as recited in claim 1 wherein the
2 synchronizing step comprises:

3 transmitting a data packet having a header and data
4 associated with the configuration information from the
5 first agent module to the second agent module;

6 acknowledging the data transmitting step by returning
7 an answer packet from the second agent module to the
8 first agent module;

9 receiving the answer packet at the first agent module;
10 and

11 repeating the transmitting, the replying and the
12 receiving steps until all of the configuration
13 information is completely transferred;

14 wherein the header in the data packet comprises a field
15 indicative of a packet transmission type;

16 wherein the answer packet is the header having the
17 field indicative of packet acknowledgement type.

1 6. The method as recited in claim 1 wherein the second
2 agent module is installed when the modular network device
3 is powered on.

1 7. The method as recited in claim 1 wherein the first
2 agent and the second agent modules have substantially the
3 same arrangement.

1 8. A method of establishing redundant management and
2 system controller functions in a modular network device

3 . having a plurality of network interface modules housed in
4 a chassis, comprising the steps of:

5 booting the modular network device with a first agent
6 module installed in a first slot of the chassis and a
7 second agent module installed in a second slot of the
8 chassis;

9 determining if the first agent module is a primary
10 agent module and the second agent module is a backup
11 agent module when a privilege signal of the first agent
12 module is asserted and a privilege signal of the second
13 agent module is de-asserted;

14 synchronizing configuration information of the network
15 interface modules from the first agent module to the
16 second agent module after a ready signal of the first
17 agent module and a ready signal of the second agent
18 module are both asserted;

19 periodically sending a message, from the first agent
20 module to the second agent module, indicating that the
21 first agent module has not failed;

22 detecting, at the second agent module, that the first
23 agent module has failed if the second agent module cannot
24 receive the message within a predetermined time interval;

25 rebooting the modular network device including the
26 first agent module and the second agent module; and

27 performing the management and system controller
28 functions by the second agent module using the
29 synchronized configuration information.

1 9. The method as recited in claim 8 further comprising
2 the steps of:

3 . respectively asserting, when the modular network device
4 is powered up, a present signal of the first agent module
5 and a present signal of the second agent module to notify
6 both agent modules that the first and the second agent
7 modules are installed;

8 asserting the privilege signal of the first agent
9 module to indicate that the first agent module in the
10 first slot serves as the primary agent module;

11 detecting, at the second agent module, that the
12 privilege signal of the first agent module is asserted;

13 holding the privilege signal of the second agent module
14 de-asserted; and

15 individually asserting the ready signal of the first
16 agent module and the ready signal of the second agent
17 module when the first and the second agent module
18 respectively complete an initialization process.

1 10. The method as recited in claim 9 further comprising
2 the step of:

3 re-synchronizing the second agent module to the first
4 agent module when any configuration information is
5 modified on the first agent module.

1 11. The method as recited in claim 10 further
2 comprising the steps of:

3 asserting the ready signal of the second agent module
4 after the rebooting step in order to indicate that the
5 second agent module has completed the initialization
6 process; and

7 asserting the privilege signal of the second agent
8 module to indicate that the second agent module has taken

9 over the management and system controller functions
10 previously performed by the first agent module.

1 12. The method as recited in claim 11 further
2 comprising the steps of:

3 if the first agent module recovers to a normal
4 operating condition after the rebooting step, performing
5 the steps of:

6 de-asserting the privilege signal of the first agent
7 module; and

8 determining, at the first agent module, if the second
9 agent module has taken over the management and system
10 controller functions when the present, the ready and
11 the privilege signals of the second agent module are
12 asserted.

1 13. The method as recited in claim 8 wherein the
2 synchronizing step comprises:

3 transmitting a data packet having a header and data
4 associated with the configuration information from the
5 first agent module to the second agent module;

6 acknowledging the data transmitting step by returning
7 an answer packet from the second agent module to the
8 first agent module;

9 receiving the answer packet at the first agent module;
10 and

11 repeating the transmitting, the replying and the
12 receiving steps until all of the configuration
13 information is completely transferred;

14 wherein the header in the data packet comprises a field
15 indicative of a packet transmission type;

16 . wherein the answer packet is the header having the
17 field indicative of packet acknowledgement type.

1 14. The method as recited in claim 8 wherein the first
2 agent and the second agent modules have substantially the
3 same arrangement.